

# Sandy Creek Park

## *Why Water?*

### In Your School & At Your City Park



A Durham Environmental Education Learning Opportunity designed  
for middle grades by the City of Durham, Environmental Education  
Unit at West Point on the Eno Park



# Introduction to the City of Durham Parks

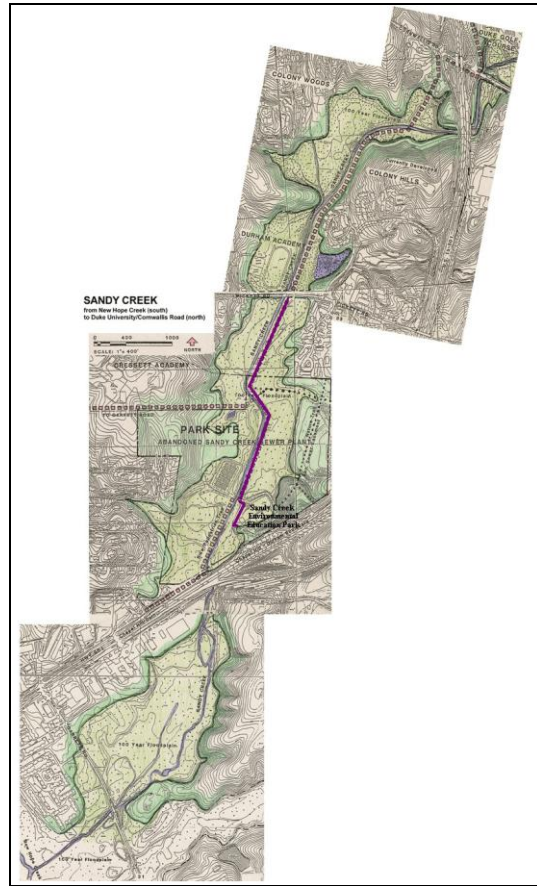
The City of Durham owns and operates over 60 parks. They serve as sites for many of Durham Parks and Recreation's athletic leagues, activities, and concerts and they are available for public use. Some of the parks are connected by greenways and trails. Often greenways are planned to connect recreation facilities with each other or with schools and neighborhoods.

Many of the parks are developed for more than one use. The uses range from wildlife habitat protection and watershed protection to active hiking and biking use.

Some of the city parks also include a neighborhood center. A neighborhood center is a safe location for the Durham youth to be after school hours. Eight of the fourteen centers are attended by the Environmental Education Unit, where they perform nature based activities. These include East Durham, Edison Johnson, E.D. Mickle, I.R. Holmes, T.A. Grady, Walltown, W.D. Hill, W.I. Paterson.



# Introduction to Sandy Creek Park



Sandy Creek Park is a restoration project that has been converted from an old Waste Water Treatment site into a Community Environmental Park. This restoration project occurred because development of buildings and parking lots in Duke's west campus and the surrounding area in Durham led to increased pollution levels in Sandy Creek.

Rainwater that would normally infiltrate the soil and slowly enter into streams and rivers is being diverted across impervious surfaces. Along the way, the water picks up pollutants such as petroleum products and fertilizers containing nitrogen and phosphorus. The water then enters into culverts and is diverted directly into Sandy Creek. This water flows into New Hope Creek and eventually into the Jordan Reservoir, a major drinking water supply for the Triangle region.

Construction of the park included Sandy Creek Trail. The trail and surrounding wetlands are teeming with wildlife. Geese, ducks, herons, hawks, bluebirds, owls, woodpeckers, deer, beavers, turtles, and water snakes have all been spotted along this trail and in the wetlands.

## **Introduction to the activity packet for Sandy Creek Park**

The environmental education learning opportunity, “Why Water?” provides a series of hands-on activities for the classroom and the outdoor setting of Sandy Creek Park. This activity packet, designed for grades 6 through 8, meets established curriculum objectives of the North Carolina Department of Public Instruction’s Standard Course of Study. There are three types of activities offered here:

1. Pre-visit activities
2. On-site activities
3. Post-visit activities

The on-site activities will be conducted at the park, while the pre-visit and post-visit activities are designed for the classroom. Pre-visit activities should be introduced prior to the park visit so that students will have the necessary background and vocabulary for the on-site activities. We encourage you to use the post-visit activities to reinforce concepts, skills and vocabulary learned in the pre-visit and on-site activities.

The Durham Environmental Education Learning Opportunity, “Why Water?” will expose the students to the following major concepts:

- . Water
- . Water cycle
- . Functions of a Wetland
- . Indicator Species
- . Aquatic Macro invertebrates
- . Stewardship
- . Watershed
- . Point and Non Point Source Pollution

The first occurrence of a vocabulary word used in these activities is indicated in bold type. Their definitions are listed in the back of the activity packet. A list of the reference materials used in developing the activities follows the vocabulary list.





## Activity Summary

The following outline provides a brief summary of each activity, major concepts introduced and the objectives met by the completion of the activity.



### **I. Pre-Visit**

#### **#1 Water Wonders**

The students will simulate the movement of water through the water cycle to understand the importance of water and living things.

##### *Major Concepts*

- **Water**
- **Water cycle**

##### *Learning Skills*

- Observing, communicating, inferring
- Processing and interpreting
- Organizing information
- Predicting

##### *Objectives*

- Describe the movement of water within the water cycle
- Identify states of water as it moves through the water cycle
- Make a connection between water and living things

**Location:** Classroom

**Group Size:** 30 or smaller, class size

**Time Considerations**

Preparation - 30 minutes

Activity – One hour

**Appropriate Season:** Any

**Materials:** Cut strips from the page “Go to the head of the cloud”, Copies of student’s page (one for each group), seven envelopes, and label for each of the seven stations, picture of the water cycle

**Suggested Extensions:** Review the water cycle chart

**Credits:** Project Learning Tree - Environmental Education Activity Guide

**#2 Wetland Metaphor Game**

The major purpose of this activity is for students to develop an appreciation and understanding of wetlands through the power of metaphor, linking the characteristics and natural functions of wetlands to the familiar realm of everyday life.

*Major Concepts*

- Functions of a **Wetland**
- **Aquatic Macro invertebrate**
- **Indicator Species**

*Learning Skills*

- Description
- Interpretation and Discussion
- Association and Application
- Comparisons and Demonstration
- Public Speaking and Summarization

*Objectives*

- Describe the characteristics of wetlands
- Demonstrate their understanding of the importance of wetlands to wildlife and humans.
- Explain and Identify what an aquatic macro invertebrate is, where it lives and how we can use them to identify the quality of the water
- Recognize why wetlands are ones of the world’s most productive **ecosystems**

**Location:** Classroom

**Group Size:** 30 or smaller, class size

**Time Considerations**

Preparation - 15 minutes

Activity – About one to one and half hours

**Appropriate Season:** Any

**Materials:** One set of materials per group is needed. Fill large paper bag with: pillow case, soap, coffee filter, sponge, baby bottle or pacifier, antacid, egg beater or whisk, cereal, sieve or strainer

**Educator Information:** Have the students read the information before they do the activity. Depending on the size of the class depends on how many filled pillow cases you will need per group.

**Credit:** Project Aquatic Wild: Aquatic Education Activity Guide, 1992, pp. 54-57

### **#3 Key to Water Quality**

The students will practice using dichotomous keys to identify unknown tree leaves and macroinvertebrates found in Sandy Creek. Students will learn that macroinvertebrates are important indicators of water quality.

#### *Major Concepts*

- **Dichotomous** key
- **Indicator Species**
- **Water Quality**
- **Aquatic food webs**

#### *Learning Skills*

- Observing, communicating, classifying
- Reading taxonomic keys

#### *Objectives*

- Use simple dichotomous keys to identify pictures of ten unknown leaves and five unknown macroinvertebrates
- Name at least two aquatic macroinvertebrates that are tolerant of pollution and two that are intolerant of pollution
- Give at least two reasons why macroinvertebrates are important to humans.

**Location:** Classroom

**Group Size:** 30 students, class size

#### **Time Considerations**

Activity – 50 minutes

**Appropriate Season:** Any

**Materials provided by teacher:** Per student or per group: One copy of the following – Students information, Key to 10 Common Leaves; 10 Common Leaves; Key to Common Macroinvertebrates; and Aquatic Life Illustrations

**Educator Information:** This activity introduces students to dichotomous keys. Students will key out several macroinvertebrates, using the same key that they will use at the park during On-Site Activity #1, “Water Bugs”. Students will also learn that macro invertebrates are indicator species that help us determine water quality. A discussion of their role in aquatic food webs is included in the Student’s Information.

**Credit:** Eno River State Park Environmental Education Learning Opportunity

## #4 Do I live in a Watershed?

The students will learn how to define a river basin, watershed, stream corridor and stream types. They will understand the concept of a watershed through a demonstration set up by the teacher.

### *Major Concepts*

- **Watershed**
- River Basin
- Stream identification

### *Learning Skills*

- Observing, communicating, classifying
- Reading a river basin and county map

### *Objectives*

- Identify the watershed in which the students live.
- Define a watershed and a river basin
- Explain the importance of protecting a watershed
- Define stream types

**Location:** Classroom

**Group Size:** 30 Students, class size

**Time Considerations**

**Preparation** – 15 minutes

**Activity** – 1.5 hours

**Appropriate Season:** Any

**Materials provided by the teachers:** per student- North Carolina River Basin Handout, North Carolina County map; (2) aluminum pans (or boxes covered with aluminum foil), modeling clay, sponges, and a dirt/sand mixture.

**Credits:** Lawrence, Margaret Athey. Integrating the Sandy Creek Restoration Project with Environmental Education. 2003. p. 29-37.





## II. On-Site Activities

### #1 Water Bugs

Get wet, have fun, and learn while doing. Students will use different methods to identify and collect organisms.

#### *Major Concepts*

- Indicator Species
- **Adaptation**
- Ecosystem
- Aquatic macro invertebrates
- **Water quality**

#### *Learning Skills*

- Observing, classifying, inferring and predicting
- Reading informational material; using keys and identification guides

#### *Objectives*

- Describe three characteristics of aquatic macro invertebrates that helps them to survive in aquatic habitats
- Use key and field guides to identify aquatic macro invertebrates
- Name three indicator species and describe how they are used to determine water quality
- List and describe five factors necessary for a healthy wetland

**Location:** Sandy Creek Park Wetlands

**Group Size:** 4-5 students

**Time Considerations**

**Preparation in class** - 15 minutes

**Activity** – 1.5 hours

**Appropriate Season:** Springtime or early fall

**Materials provided by Park educator or teachers:** nets, buckets, magnifying glasses, aquatic macro invertebrate's identification charts

**Materials provided by the students:** Pencil, comfortable clothing appropriate for a short hike.

**Educator Information:** You can split your group up into two sections: one collecting macroinvertebrates at the wetland and the other collecting at the creek. The students should have done the Pre-visit Activity #1, "Water Wonders" and Pre-Visit Activity #2, "Wetland Metaphors" previous to this activity.

**Special Considerations:** This activity requires a short hike on a paved greenway and through tall grasses. Students with physical disabilities should have not problem getting to the site, but may have difficulty with the activity as it occurs on the ground of the wetland. It is recommended that students wear closed shoes and put insect repellent on their feet and ankles to guard against ticks and chiggers. Be prepared for hot, humid weather and dress accordingly.

**Credit:** Eno River State Park Environmental Education Learning Opportunity

## #2 Mind your p's and H's – The Power of Hydrogen

Learn to measure pH by using hands-on methods to determine the pH value of several different liquids including water from Sandy Creek.

### *Major Concepts*

- Water Quality
- pH range (acid-neutral-base)
- Acid precipitation

### *Learning Skills*

- Observing, classifying
- Reading informational materials with complex vocabulary

### *Objectives*

- Demonstrate the use of litmus paper and the LaMotte test kit for determining pH
- Find the pH of water from three different sources (Sandy Creek water, distilled water and tap water)
- List two natural influences that can affect the pH rating of the wetland/creek area.
- List two human influences that can affect the pH rating of the wetland/creek.
- State the North Carolina Environmental Management Commission pH range for Aquatic Macroinvertebrates.

**Location:** Sandy Creek Park

**Group Size:** 8 students

**Time Considerations**

**Activity** – 30 minutes

**Appropriate Season:** Springtime or early fall

**Materials provided by the teachers:** pencils, student worksheet (one copy per student), test paper, LaMotte Test Kit, sample items (distilled water, vinegar, lemon juice, liquid plumber, Roloids, Coca-Cola, soap, baking soda)

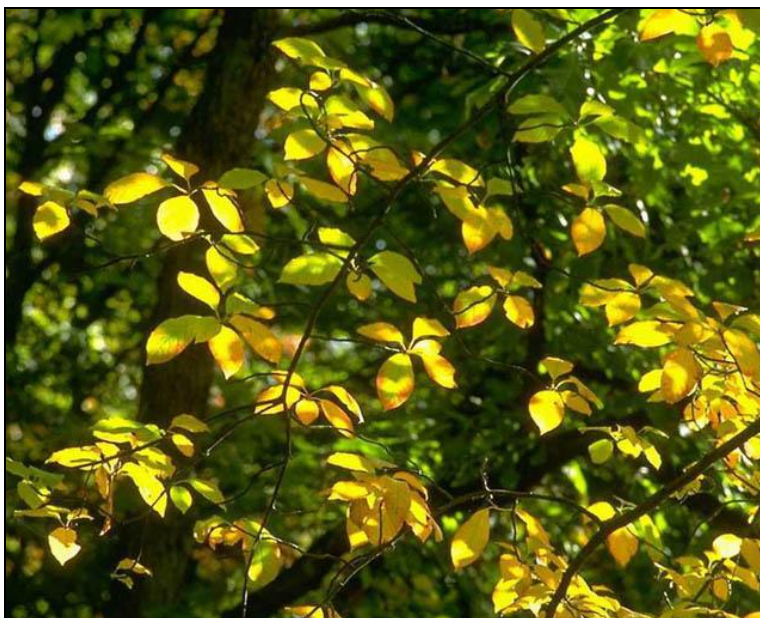
**Materials provided by the park educators:** “pH Ranges That Support Aquatic Life” Poster, rainwater collected at Sandy Creek park

**Educator Information:** In this activity, students will test the pH of several household products, as creek and wetland water. Either the school teacher or park educator will lead a discussion focusing on the pH scale, what pH ranges aquatic life will tolerate, and natural and human influences that can change the pH of a creek or wetland. The students will use litmus paper to test the pH of several items and record their results on the “Sample pH Range” worksheet. They will also use a LaMotte test kit to test the pH of distilled water and Sandy Creek water and wetland water. This will also be recorded on the same worksheet. Either the school teacher or park educator and the students will discuss their results and compare them to the “pH Range that support Aquatic Life” poster. They will note the extreme ranges of the samples and be able to determine which **organisms** might be able to live in water with that pH.

Have the students read the Student's Information prior to the park visit.

**Special Considerations:** Chemical reagents are used in water quality testing. Because misuse of these chemicals can be hazardous, standard chemical protection procedures will be required. Goggles and rubber gloves will be provided for all students handling testing kits. These must be worn at all times during test procedures. The educator will assist in seeing that all safety precautions are followed.

**Credit:** Eno River State Park Environmental Education Learning Opportunity



### III. Post- Visit Activities

#### #1 Sum of the Parts

You have just inherited valuable waterfront property and \$8 million dollars. You are told that you can do anything you want this property, from building an amusement park to keeping it as a land preserve. Through this activity, students will demonstrate how everyone contributes from the conservation of a wetland to the destruction. The students will observe the interaction with the watershed and recognize that everyone's "contribution" can be reduced.

Purpose of activity: To distinguish between point and non-point source pollution and human induced hazards in our watershed which includes our wetlands.

#### *Major Concepts*

- **Watershed**
- Reading a map (watershed)
- **Point and Non Point Source Pollution**
- **Stewardship**

### *Learning Skills*

- communicating
- reading and interpreting maps
- inferring and predicting

### *Objectives*

Students will understand the effect of different land uses and the impact on water quality as it enters any water source (figure out one in SANDY CREEK) They will also understand the concepts of watershed and learn how their actions can affect water quality both positively and adversely.

**Location:** Classroom

**Group Size:** Depending on the size of the class – there should be at least 3 students per waterfront property.

### **Time Considerations**

**Activity** – 45 minutes to an hour

**Appropriate Season:** Any

**Materials provided by the teachers:** A long piece of paper with a body of water drawn through the length of the paper (leave space on either side of the water, so the student can develop it). Cut up paper into the amount of groups.

**Credits:**

## **#2 Troubled Waters**

After reading a story about the discovery made by two young river enthusiasts, students will create their own ending. Optionally, the class can develop an action plan to correct aquatic pollution problem in their community.

### *Major Concepts*

- Water pollution
- Environmental issues
- **Stewardship**
- **Environmental sustainability**

### *Learning Skills*

- Communicating, inferring, predicting
- Problem solving
- Creative writing

### *Objectives*

- Identify two potential cause and effect relationships involving aquatic pollution.
- List and evaluate two alternative solutions to aquatic pollution.
- Create an action plan to reduce pollution and improve sustainability of a wetland, stream, pond or other body of water.

**Location:** Classroom

**Group Size:** 30 Students, class size

**Time Considerations**

**Activity** – Two or more 45 minute class periods.

**Appropriate Season:** Any

**Materials provided by the teachers:** Per student- “Student’s Information” and “Troubled Waters”

**Credits:** “Something Fishy Here”, Project WILD Aquatic Education Guide – 1987, 1992. Council for Environmental Education. Adapted with permission from Project WILD. In North Carolina - Project WILD environmental education program. For information about NC WILD, contact the NC Wildlife Resources Commission, Division of Conservation Education, 1712 Mail Service Center, Raleigh, NC 27699-1712.





## **Correlation Chart**

<b>#1 Pre-Visit Activity : Water Wonders</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 4.01	1.02, 1.03	1.02	4.01, 4.02, 4.06
<b>7</b>	1.04, 1.05, 1.08	1.02, 1.03, 2.01	1.02	
<b>8</b>	1.04, 1.05, 3.02	1.02, 2.01		

<b>#2 Pre-Visit Activity : Wetland Metaphor</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 4.01-4.05, 7.01- 7.04	1.03, 1.04, 2.01		
<b>7</b>	1.05, 1.08	1.02, 1.03, 2.01		
<b>8</b>	1.05, 1.08, 3.01-3.08	1.02, 1.03		

<b>#3 Pre-Visit Activity : Key to Water Quality</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.06, 2.01, 2.02, 1.08, 7.01, 7.05, 7.06	1.03, 1.04, 2.01		
<b>7</b>	1.02, 1.04, 1.05, 1.08, 2.01, 2.02	1.02, 1.03, 2.01		
<b>8</b>	1.02, 1.04, 1.05, 1.08, 2.01, 2.02, 3.01- 3.08	1.02, 1.03		

<b>#4 Pre-Visit Activity: Do I live in a Watershed?</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 4.01-4.05, 7.01- 7.04	1.03, 1.04, 2.01		
<b>7</b>	1.02, 1.04, 1.05, 1.08, 2.01, 2.02	1.02, 1.03, 2.01		
<b>8</b>	1.05, 1.08, 3.01-3.08	1.02, 1.03		



<b>#1 On-Site Activity : Water Bugs</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.03, 1.05, 1.06, 1.08, 4.01 - 4.05, 7.01-7.04	1.03, 2.01		INDEX RATING
<b>7</b>	1.03, 1.04, 1.05, 1.06, 1.08	1.03, 2.01		
<b>8</b>	1.03, 1.04, 1.05, 1.08, 3.02-3.08	1.03, 2.01		

<b>#2 On-Site Activity : Mind your p's and H's – Power of Hydrogen</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 4.01- 4.05, 7.01- 7.04	1.03, 1.04, 2.01		
<b>7</b>	1.05, 1.08	1.02, 1.03, 2.01		
<b>8</b>	1.05, 1.08, 3.01- 3.08	1.02, 1.03		

<b>#1 Post-Visit Activity : Sum of the Parts</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 3.06, 3.08 7.03, 7.05	1.03, 2.01	1.02	
<b>7</b>	1.05, 1.08	1.03, 1.04, 4.03, 6.01	1.02	
<b>8</b>	1.05, 1.08, 3.02, 3.07, 3.08	1.01, 1.03, 1.04, 3.02		

<b>#2 Post-Visit Activity : Troubled Waters</b>				
<b>Grade</b>	<b>Science</b>	<b>Eng. Lang. Arts</b>	<b>Soc. Stu.</b>	<b>Math</b>
<b>6</b>	1.05, 1.08, 3.06, 3.08 7.03, 7.05	1.03, 2.01	1.02	
<b>7</b>	1.05, 1.08	1.03, 1.04, 4.03, 6.01	1.02	
<b>8</b>	1.05, 1.08, 3.02, 3.07, 3.08	1.01, 1.03, 1.04, 3.02		

